

an aurora, which was widely observed, and also with earth currents affecting the telegraphic wires. From the appearance of the traces one is inclined to associate the aurora and earth currents with the oscillations of declination rather than with those of the other elements.

On February 11, a little after 6 p.m., another disturbance took place, which continued more or less for thirty hours. As in the previous case the oscillations of the declination were most marked, but these were not so excessive as for the previous disturbance. An aurora was visible at 8 50 p.m. of February 11, and one was said also to have been observed on February 12.

The following is the record of sun-spots derived from the pictures taken :—

February 5 ...	4 small groups	2 large ones
" 6 ...	5 "	1 rather large, 1 very large
" 8 ...	5 "	2 large, 1 very large
" 10 ...	3 "	4 large, 1 very large
" 11 ...	4 "	2 very large
" 15 ...	5 "	1 large, 2 very large
" 20 ...	7 "	1 large
" 21 ...	5 "	1 large
" 22 ...	5 "	
" 24 ...	4 "	
" 25 ...	3 "	
" 26 ...	4 "	

THE EXISTENCE OF MAN IN THE TERTIARY EPOCH

IN the *Bibliothèque Universelle et Revue Suisse* for the 15th February, M. Favre, in an article on the above subject, remarks that for some years the discovery of traces left by man of the pre-historic age on the earth have multiplied with a rapidity only explicable on the supposition that the population inhabiting a certain region of the globe was formerly abundant, and that numerous observers have recently applied themselves to the subject with extraordinary energy and zeal. He takes up the question whether the age of stone does or does not extend back to the tertiary period, and he thinks it will prove interesting to give a *résumé* of the various observations tending to show that man inhabited the earth at an epoch anterior to the great extension of the glaciers southwards, and during the tertiary epoch. On *à priori* grounds no substantial reasons can be advanced against the existence of man at the latter period. The temperate zone was then somewhat warmer than at present, and the temperature of Greenland and Spitzbergen sufficiently agreeable to be adapted to the development of terrestrial mammals. But it is difficult to represent the duration of the period that elapsed between the end of the tertiary deposits and the termination of the glacial epoch. The portion of the quaternary period characterised by the enormous extension of the glaciers was very protracted, and many ages must have elapsed before the glaciers of the Alps were so large as to be able to transport erratic boulders to the height of 1352 metres on the Jura (near Soleure), and the glacier of the Rhone approximated the Rhine, or perhaps even reached it by passing across the cantons of Valais, of Vaud, of Freiburg, of Berne, of Soleure, and of Aargau. The form of the earth's surface must have presented to the eye of such old world inhabitants a very different aspect from that exhibited at present, and if they already existed in the middle tertiary period, they would have been contemporary with the upheaval of the Alps, and with an almost entirely distinct flora and fauna. Under these circumstances man would have to be included amongst the creatures who have survived two geological periods. M. Favre then proceeds to review the evidence that has at present been collected, embracing the following points :—First, the observations of M. Desnoyers in 1863 made at Saint-Prest near Chartres, but previously (1848) known to M. Boisville, and (1860) to MM.

Langel and Lartel. Here, in a pliocene formation, were found the bones of the *Elephas meridionalis*, *Hippopotamus major*, *Equus arvensis*, *Cervus carnulorum*, and two other species of *Cervus*, *Bos*, *Trojanotherium Cuvieri* (a kind of large beaver), striated in such a manner as to convince M. Desnoyers that the markings were the effects of the handiwork of man. This conclusion has, however, been contested by Sir C. Lyell; but in 1867 arrow or lance-head flint instruments were found in this spot by M. l'Abbé Bourgeois, one of which appeared to have been subjected to the action of fire, though this might have resulted from exposure to forests burning by the action of lightning. Soon afterwards M. Delaunay discovered markings of an analogous nature to the former, on the bone of a *Halitherium* at Pouancé (Maine et Loire) in a miocene formation containing the bones of *Dinotherium*. About the same time M. Bourgeois found similar flints in a still older formation (the calcareous strata of Beauce) at Thénay, and at Billy near Selles-sur-Cher. Some differences of opinion exist as to whether these flints are really worked by the hand of man; but the majority of those who have seen them, and are competent to judge, is decidedly in favour of that view. Nevertheless, M. Fraas observes that he has himself seen a lamina of silex become detached from a mass by the action of the sun's rays alone in Egypt; Livingstone and Dr. Wetzstein seem to have observed similar phenomena; and a point that now demands intelligent observation is the greater or less similarity such fragments detached by natural causes bear to the flint instruments or the masses from which they have been detached. He refers also to two fragments of the jaw of a *Rhinoceros pleuroceros* found in the lacustrine chalk of Limaque, and which appear to have been grooved by man, which, however, he admits to be doubtful; and to the observations of Whitney in California, which tend to show the existence of man anterior to the glacial epoch and to the period of the mastodon and elephant, at an epoch since which vertical erosion of the surface has taken place to the extent of two or three thousand feet of hard and crystallisable rocks. Finally he refers to the observations of M. Issel in Piedmont.

MODIFICATIONS IN THE CONSTRUCTIONS OF THE NEST OF THE SWALLOW

IN the tenth number of the *Comptes Rendus* for the present year, is a paper by M. Pouchet, on the Modifications of the Nests constructed by the common Swallow, (*Hirundo urbica* Linnæus,) in which he remarks that it is evident the mode of life of certain animals, far from being persistent and invariable, undergoes modifications under different terrestrial conditions, and that, in many instances, their habits are different from what they were in former ages. Spallanzani indeed remarks in one of his remarkable memoirs on the swallows, that the shape and structure of the nests of birds are interesting features in their history, and that each species constructs its habitation on a plan peculiar to itself, which never changes, and is continued from one generation to another. And this opinion is shared by many naturalists; observations, however, when sufficiently close and attentively made, show that it is erroneous. We do not indeed see any modifications of those of their habits which are associated with their biology, so that the arboreal species seek to form for themselves a subterranean nest, or rear their young ones in dwellings adherent to the coigns of our houses, but it nevertheless is ascertained that in a succession of years, each learns to improve the construction of his residence. Certain birds work up only the products of our own handiwork, and would necessarily employ natural substances if these were deficient. Thus, as may be seen in the museum of Rouen, the Lorient of Europe sometimes forms its nest with thread ends under the

branches of trees, which cannot possibly be the natural method. For several centuries the common swallow has disported itself in our crowded cities, and with its friendly masonry attached itself to our houses. The chimney swallow, still more familiar and audacious, often builds in the smoky shafts of our domiciles, or even in the noisiest factories, undisturbed by the din or the fires or the movement around them. Such habits must form a strong contrast with those of their predecessors in times long gone by. When we ourselves wandered untutored savages in the prehistoric times, or when still later we constructed lacustrine towns, or megalithic monuments, the habits of the birds can scarcely have been identical with those of to-day, for such human edifices afforded little security or shade. They must then have built amongst rocks. Nearly the same remarks apply to the storks, which have not remained stationary, but have preferred to their less commodious dwellings those offered to them by man. These changes in the industry or the manners of birds are perhaps even more rapid than we might at first sight suppose; and M. Pouchet's observations have demonstrated to him that notable improvements have been adopted by swallows in their modification during the first half of the present century. Having directed a number to be collected for the purpose of having drawings made from them, M. Pouchet was astonished to find that they did not resemble those he had collected some forty years ago, and which were still preserved in the museum of Rouen. The present generation of swallows have notably improved on the architecture of their forefathers, amongst those still building in the arches and against the pillars of the churches. Some, however, still adhere to the old methods, or such nests may possibly have been old ones which have undergone reconstruction. In the streets, on the other hand, all the nests appeared to be constructed on the new method. And now for the differences observed. The old nests show, and all ancient writers as Vieillot, Montbrilland, Rennie, Deglaud, &c., describe the nest of the house-swallow as globular, or as forming a segment of a spheroid with a very small rounded opening, scarcely permitting the ingress and egress of the couple that inhabit it. The new nests, on the contrary, have the form of the quarter of a hollow semi-oval (le quart d'un demi-ovoïde creux), with very elongated poles, and the three sectional surfaces of which adhere to the walls of edifices throughout their whole extent, with the exception of the upper one, where the orifice of the nest is situated; and this is no longer a round hole, but a very long transverse fissure formed below by an excavation of the border of the section, and above by the wall of the building to which the nest is attached. This opening has a length of nine or ten centimetres and a height of two centims. M. Pouchet considers this new form affords more room for the inmates and especially for the young which are not so crowded, whilst they can put out their heads for a mouthful of fresh air, and their presence does not interfere with the entrance and exit of the parents. Lastly, the new form protects the inhabitants of the nest better than the old one, from rain, cold, and foreign enemies.

THE ROTUNDITY OF THE EARTH

A RECENT number of the *Field* contains an account of a very amusing investigation which has been recently conducted on the Bedford Level to settle the question whether the earth is a globe or not! It appears that a Mr. Hampden threw out a challenge by which he offered to pay 500*l.* to anyone who would prove the rotundity, which challenge has been taken up by Mr. A. R. Wallace, who has lodged a similar sum with the Editor of the *Field*. To test this point, six miles of the Bedford Level were used, three signals, each 13 feet 4 inches above the water level, being put up

three miles apart. Mr. Wallace asserted that if he were correct the central signal would appear elevated about 5 feet above the line joining the other two; Mr. Hampden holding, of course, that they would all be in the same straight line. It is needless to say what the result was, but we now come to a part of the story which is not so amusing, and here we quote from the *Field*:—

Both Mr. Hampden and Mr. Carpenter assented to the details of this experiment in our presence as conclusive, although we regret to say that Mr. Carpenter alleged his opinion was founded upon theory alone, and that it had never, as far as he knew, been tried. Now, the fact really is, that in a little treatise published by "Parallax," and which we have now in our possession, with Mr. Carpenter's name on the title-page, in his own handwriting, an experiment similar in its nature is described as having been made on the very same piece of water as that on which we were then occupied, with a result exactly the reverse of that which recently occurred. Mr. Carpenter was, in fact, engaged to decide a disputed question of which he and his principal professed to be practically ignorant, although it was in print on the authority of the head of their sect that it had already been tried in the same locality; and *this must have been then known to Mr. Carpenter, and has since been admitted by him in our presence.* The good faith and perfect fairness of Mr. Carpenter were not, therefore, quite of the nature we then believed them to be, and we have no hesitation in affirming that he was a most improper person to be selected to act as referee in such a matter. The deception was, to say the least of it, "unscientific;" yet Mr. Carpenter and his master, "Parallax," both profess to be ardent in the cause of science; and that it has recoiled upon their heads can cause no regret to anyone who values the truth.

Although the diagrams of what was seen by the telescopes used at both ends, and acknowledged to be correct by Mr. Carpenter and Mr. Hampden, show the central signal more than 5 feet above the line of the two extremes, these gentlemen coolly claim the victory, and threaten to bring an action against the Editor of the *Field* (who was appointed umpire by Mr. Hampden himself) for fraudulently deciding against them.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.]

On Prof. Tyndall's Exposition of Helmholtz's Theory of Musical Consonance

IN NATURE for March 3 you published a letter of mine, in which I stated that the exposition of Helmholtz's theory of musical consonance given in Prof. Tyndall's lectures on Sound was both "radically different from the original, and erroneous." I supported my assertion by a series of arguments which, both to myself and to other competently informed persons, appeared conclusive.

Prof. Tyndall has taken no notice, public or private, of my letter, although he has since its publication written in your columns on another subject.

Your readers, as well as myself, are surely justified in calling on Prof. Tyndall either to rebut my argument or admit my conclusion.

Trinity College, Cambridge, March 29 SEDLEY TAYLOR

[Prof. Tyndall's Lectures on Sound have been translated into German, and the following is a verbatim copy of the "Vorwort des Herausgeber":—

"Die Vorlesungen welche Herr Tyndall als Nachfolger der grossen Naturforscher Davy und Faraday in dem Wintermonaten vor den gebildeten Kreisen Londons in der Royal Institution über die verschiedenen Theile der Physik zuhalten pflegt, haben in England allzeitige Anerkennung gefunden. Herr Tyndall besitzt in ungewöhnlichem Grade die Gabe, durch die glückliche Vereinigung einer eben so klaren wie eleganten Darstellung, mit vortrefflich ersonnenen und schlagenden Versuchen selbst die schwierigeren Lehren der Physik dem gebildeten Publikum zugänglich zu machen. Eine Herausgabe seiner Vorlesungen in deutscher Bearbeitung dürfte desshalb auch bei uns nicht wenig zur Verbreitung physikalischer Kenntnisse in weiteren Kreisen beitragen. Die Unterzeichneten haben